Prediction

Models of financial markets

Doyne Farmer has formed Prediction Co. in Santa Fe, N.M., which uses genetic algorithms and other methods to create models of financial markets that are drawn from statistical history and the computer's randomly generated solutions instead of from explicit instructions.
And Axcelis Inc's Evolver even puts a little evolutionary punch onto your desktop PC's spreadsheets – allowing the computer to churn out potential solutions to, say, finding the best combination of investments to guarantee an acceptable balance of risk and reward in a stock portfolio.

(newsweek, 1992)

Chip Design

"Then you have this 'aha' moment."

Texas Instruments wanted to design a computer chip on the smallest piece of silicon possible.
A genetic algorithm came up with a circuit design that took up 18 percent less space, using a strategy of cross connections that no human had thought of.
"A genetic algorithm will usually come up with something very different from what a human would," says Illinois's Goldberg.
"Then you have this 'aha' moment."

(newsweek, 1995)

Engineering

A single percent improvement

One genetic algorithm discovered a design for a gas turbine that went on to become the engine for the Boeing 777, made by General Electric.
It is almost 1 percent more efficient in its use of fuel than previous engines. In a mature field like gas turbines, 1 percent is a windfall.

(newsweek, 1995)

Network Optimisation

... essentially solve the problem overnight

US West had to lay a huge network of fiber-optic cable, something usually done by a designer relying on intuition and experience. But the company instead unleashed a genetic algorithm. After mating and mutating, code that produced networks with less cable survived; code that produced networks with more died. Design time for new networks has fallen from two months to two days and saves US West $1 million to $10 million each. (newsweek, 1995)
Consultant David Davis of Cambridge, Mass.-based Tica Associates designed a genetic algorithm for US West that attacked the problem with the "survival of the fittest" approach. Davis "came within 1 percent of our solution," says Tony Cox, technical director for US West Advanced Technology, "and instead of having to put in weeks of research time and hours of CPU [computer] time he was able to essentially solve the problem overnight." (newsweek, 1992)

Financial Modelling

... the rigorous testing of natural selection

First Quadrant, an investment firm in Pasadena, Calif. that manages a $10 billion portfolio of pension funds, uses genetic algorithms not merely to save money but to make it. A lot of it – more than $30 million since 1993. The company uses genetic algorithms that encode general models for investing, ... Thousands of different models compete; each one has a different set of rules (one model might say buy stocks when price/earnings ratios are below 15, another might say to buy when the P/E is dropping). By testing the models against historical market data, First Quadrant learned which ones were the most "genetically fit," ... Models that make money live; ... The models built by genetic algorithms made $255 for every $100 invested over six years, compared with $205 for a model that didn't undergo the rigorous testing of natural selection.

(newsweek, 1995)

Risk assessment

Identifying a "fitness function"

Marks & Spencer, the British retailing giant, uses genetic-algorithm software from Ernst & Young to evolve incremental improvements in its scoring formula to assess the creditworthiness of customers.

(FORBES, Oct. 21, 1996).

Job scheduling

Proprietary software under MS windows

In August 1996 Volvo spent half a million dollars on a program called OptiFlex from a company (Optimax) that has since been acquired [for 53M USD] by I2 Technologies
Other customers: John Deere plants, GE Appliances

(FORBES, Oct. 21, 1996).

Aerospace Engineering

Thin air

NASA used genetic algorithms developed by Engineous Software of Morrisville, N.C. to optimize the design of a plane that samples ozone depletion at 75,000 feet. It's a tricky task to make the engine both light and efficient in thin air.

(FORBES, Oct. 21, 1996).

Route Scheduling

An exotic approach to programming

PointServe uses genetic algorithms to find optimal, or near-optimal, solutions to scheduling problems. In this exotic approach to programming, you let a computer try out random variations in code and then keep the "fittest" formulas.
Southern Union, a gas distributor in PointServe's hometown, aims to use the software to schedule visits by some of the 200 technicians who cover the western half of Missouri, serving 500,000 customers. It's invested $2.6 million for an 8% stake in PointServe. Southern Union's president, Peter H. Kelley, says he hopes that PointServe can reduce the $47 cost of a service call by 17%.

(Forbes, 1999)

Applied Mathematics

Pseudo random noise generation

Genetic algorithms can be used to construct random codes of any desired length, optimized for any potential FOM [figure of merit] imaginable, and implemented during the design of the PRN [pseudo random noise] sequences. (For further details, see the patent application by J. Winkel ...)

(InsideGNSS, 2011)

Financial Analysis

Automated investment systems

Hyde Park Global Investments is a 100% robotic investment and trading firm based on Artificial Intelligence (AI). The system is built primarily on Genetic Algorithms (GA) and other Evolutionary models to identify mispricings, arbitrage and patterns in electronic financial markets.

[Your-Story.org, 2011]

Evolutionary Robotics

How the Body Shapes the Way We Think: A New View of Intelligence

Recognized for his work in evolutionary robotics, University of Vermont researcher Joshua Bongard was honored with the highest award given by the U.S. government to young scientists, the second faculty member in UVM history to win the award.
President Barack Obama named Bongard among 94 people to win the Presidential Early Career Award for Scientists and Engineers on Monday. The award comes with $500,000 to support Bongard's research over the next several years. ... he uses computers to run genetic algorithms, which simulate evolution in robots to automatically become better and more efficient over time.

(Rutland Herald, 2 Oct .2011)

Optimisation

Evolver Solutions for Business

That is, he tackles problems that cannot accurately be solved using Excel's Solver or other traditional linear optimization tools. Instead, Prof. Nersesian leverages the power of genetic algorithms in Palisade's Evolver software to address issues ranging from managing a stock portfolio to the timing of new plants.

(Book review in Market Watch, Sept. 28, 2011)

Face Identification

Can you name these four villains?

The latest photofit technology that is revolutionising the way police catch criminals: 'Using genetic algorithms you could 'breed' those numbers [features] or faces together but with mutation in-built so there are constant variations. You would have "good" and "bad" numbers, but over time the witness would hopefully filter out the bad numbers.'

(Daily Mail, 10 Sept. 2011)

Advertising

A pioneer within the online advertising field

Admeta was founded in 2002 and is a pioneer within the online advertising field with the Echo product for advertisers. The technology included campaign monitoring and ROI analysis, ad-serving and optimisation based on genetic algorithms (artificial intelligence). In 2008 Tango was launched and quickly became a highly appreciated and essential yield optimisation tool for leading media houses. Admeta provides state-of-the art optimisation system with unique domain knowledge and yield support.

(PR Newswire, 21 Sept. 2011)

Acoustics

Closer to Achieving Acoustic Undetectability of Objects

The acoustic cloak developed by these researchers contains 120 aluminium cylinders 15 mm in diameter, surrounding a 22.5 cm cylinder. The position of each cylinder in the cloak has been obtained by using optimization techniques based on genetic algorithms (numerical algorithms which mimic Darwinian evolution).
"... improve the acoustics of the urban environment or the sound insulation of auditoriums, or to create helmets to better protect our ears from extreme noises".

(August 2011 Applied Physics Letters,
from Product Design and Development,
pddnet.com, Sept. 2011)

Text Analysis

Teen Programmer Hopes To Make A Million From A.I. App

Trimit is a bit like the auto-summary tool you'll find on Microsoft Word, but, according to D'Aloisio, it's smarter. Currently free on the App store, it uses a unique algorithm that D'Aloisio created based on "genetic programming" and artificial intelligence.

(Forbes, 2011)

Conclusion

(by newsweek)

Success stories shouldn't obscure the difficulty of creating a genetic algorithm.